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Returns to Foreign Education.

Yet another but different cross country analysis.

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Abstract

The main interest of this paper is to compare the value of education systems of different countries. For this reason I use data on workers who have completed their education before immigrating to Switzerland to estimate a country specific return to education. I estimate the standard Mincer-equation with the extension that I additionally allow for country specific returns to education. Results show that there are important differences between the returns to different education systems within Switzerland in the value of the basic education on the one hand and the return to an additional year of education on the other hand.

JEL-Classification: C13, J61, I21

Keywords: return to education, immigration, international comparison

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1 Introduction

The aim of this paper is to compare the value of education systems of different countries. Since the seminal work of Becker (1964) economists discuss educational choices in the context of a utility maximizing person who invests as long in education as the present value of the costs of investment equals the present value of the returns of the investment. The Mincerian wage equation (Mincer (1974)) allows to calculate this return to education. Regressing a semilogarithmic function with the log wage as a dependent variable and the years of schooling and some additional control variables as regressor variables provide the economic value of an additional year of education as a percentage wage increase. Card (1994) shows the relation between the optimal level of schooling according to Becker and the return to education according to Mincer. This method has been applied in hundreds of studies with different setups and for nearly every country of the world.[1] The results are stable over time and vary little across countries between 5% and 10% of wage increase per year of schooling.

Table 1 shows selected estimation results for the countries of interest presented in Harmon and Westergaard-Nielsen (2001). The return to education differs between countries and between men and women. Interestingly the countries with the highest returns for men are Portugal and the UK, while the return to education for women is highest in Germany and Switzerland. One reason for the differences between countries might be the differences of the education systems described in the appendix. Beside this there may exist differences in the labor markets or the institutional settings. In some of the countries it is more critical to have compulsory schooling, in others additional schooling might be more important. Some countries do have stronger unions and thus a more compressed wage structure, other countries might be more liberal. Thus estimating the return to education within different countries might not reveal the real return but the return plus some labor market specific components.

In this study I compare the value of education systems of different countries within one country. I look at the return to education of foreigners who have completed their education in their home country but work in Switzerland. The advantage of this strategy is that I concentrate on one labor market instead of multiple labor markets to calculate the return to education and that I look at workers who all need a working permission of the immigration office (Fremdenpolizei). Switzerland is a good candidate for this approach

[1] Psacharopoulos and Patrinos (2002) provide a huge set of returns to education for different countries and years. They distinguish between the private and the social return to education. In this paper I concentrate on the private return. For Europe the two-year PURE (Public funding and private Returns to Education) project, which started in November 1998 and studied among other things the dispersion of private returns to education in 15 European Countries, provides a very broad pool of comparable returns. (Asplund and Pereira (1999) and Harmon et al. (2001))

Table 1: Return to Education in Europe

	Men	Women
Austria	0.069	0.067
Germany	0.079	0.098
Netherlands	0.063	0.045
Portugal	0.097	0.079
France	0.075	0.057
UK	0.094	0.079
Italy	0.062	0.046
Finland	0.086	0.088
Spain	0.072	0.084
Switzerland	0.090	0.095

Source: Harmon and Westergaard-Nielsen (2001)
Note: Turkey was not part of this study.

for several reasons. First,each foreigner who applies for a job in Switzerland has to fulfill two conditions to get an permission: (1) The potential employer has to have vacancies for foreigners (There are limited working places for foreigners which are allocated by the immigration office). (2) the potential employer has to prove that there is no Swiss who is at least as qualified for the job as the applicant.[2] These rules are valuable because they assure that only foreign workers are employed who have a standardized quality. Second, Switzerland has a diverse an significant foreign workforce. About 25 % of the labor force are foreigners of which more than 50 % are either citizens of the EU or the EFTA (Bundesamt für Statistik (2004)). In 1998 only Luxembourg had a higher fraction of foreign workforce (57.7 %) while all other European countries had a foreign labor force below 10 % (OECD (2001).

To analyze the return of different education systems I estimate the standard Mincer-equation with the extension that I include a country specific intercept and additionally interact the years of schooling with the nationality. Results show that there are significant differences between the returns to different education systems in Switzerland in the value of the basic education on the one hand and the return to an additional year of education on the other hand.

To validate my findings I compare the estimated returns to additional education with returns provided in table (1) and the returns to basic education with the PISA scores. The first is uncorrelated (women) or even negative correlated (man) and indicates the possible importance of estimating returns to education within one labor market. The positive correlation with the PISA scores suggests that the economic value of education and the

[2]Since June 2002 (coming into effect of the bilateral agreements between Switzerland and the EU) the rules are stepwise released. Since June 2004 regulation (2) is suspended, while regulation (1) will hold until June 2007. I use data of 2002 and 2003, thus these changes do not affect my results.

quality of schooling are somewhat comparable.

The paper is organized as follows. In the next section I introduce the data and show some descriptive statistics before I discuss the estimation method in section 3. In section 4 I provide and discuss the estimation results. Section 5 concludes this paper.

2 The Data and Descriptive Statistics

In this paper I use the Swiss Labor Force Survey (SLFS) 2002 and 2003. In general the SLFS is a yearly telephone based interview of randomly selected households, including Swiss and foreigners who permanently live in Switzerland, which contains very rich information about the working life and the personal situation of individuals. The SLFS 2003 includes a special module on migration in which foreigners are represented superproportional: instead of 20 % of foreigners in the working population this dataset contains almost 50 % of foreigners. For this study I use a pooled panel of 2002 and 2003 and concentrate on fulltime employees. I exclude observations of countries with less than 35 observations[3]. This leads to a sample of 17'092 persons, of which 11'051 are Swiss and 6'041 are foreigners.

Table 2 reports the average years of schooling[4] and the average hourly wage[5]. The average Swiss earns about 44.86 Swiss Francs per hour and has 13.09 years of education. Both is slightly higher than the average of all employees. There are big differences between the nationalities. Additionally the variance within the nationalities differs a lot. Persons with British or Finish nationalities are both higher educated and earn higher wages while those from the southern parts of Europe have lower education and lower wages. One reason might be, that these countries are typical immigration countries.

Table 3 shows the average years of schooling and the average wage for foreigners who completed education in their country of origin (Foreign Education[6]) and those who obtained education completely in Switzerland (Swiss Education[7]). On the one hand, there

[3]Finland as the country with the best PISA scores is an exception. Additional I exclude Belgium, because there is no Belgian who has obtained education in Switzerland. I need this later to evaluate nation specific characteristics.

[4]In the SLFS only the highest level of received education is reported. To compare the education systems I use the numbers of years which are necessary to receive the reported level of education in Switzerland. This leads to some noise because of the differences in compulsory schooling for example, but with the SLFS-data it is not possible to use a different approach. However, this procedure allows to compare the education systems and thus seems to be appropriate.

[5]Because of the survey character of the data, there are some implausible wages. Thus I eliminate all observations with a log wage of 4 standard deviations above or below the average log wage.

[6]Because I do not have information on the country in which a person has completed education directly, I use the nationality and the age of immigration as proxy. Only persons which immigrate with at least 26 years are selected.

[7]These are foreigners who were born in Switzerland or immigrated before their 7th birthday.

Table 2: Education and Wages: All Employees

country	Nobs	Years of educ.		Wage	
		mean	SD	mean	SD
Germany	873	15.53	3.24	53.25	23.34
Finland	26	16.02	3.42	55.62	18.60
France	560	14.33	3.36	48.47	26.06
United Kingdom	164	16.00	3.52	65.86	34.41
Italy	2,476	11.72	2.48	37.33	14.78
Netherlands	104	15.41	3.05	56.57	27.14
Austria	188	13.81	2.91	45.20	18.74
Portugal	859	10.19	1.87	30.34	10.19
Spain	546	11.45	2.61	37.26	16.61
Turkey	245	11.48	2.99	32.64	12.91
Switzerland	11,051	13.09	2.58	44.86	19.10
SD	17,092	12.89	2.86	43.46	19.60

Source: SLFS 2002 and 2003, own calculations.

are no huge differences among workers from traditional immigration nationalities (with exception of the education of Spanish and Turkish workers). On the other hand, there are big differences for nearly all other nationalities. Persons who have obtained Swiss education have on average less years of education and earn less than those with the same citizenship. Additional the variation of wages as well as of years of schooling is lower for those who obtained Swiss education. This might be evidence for selectivity but also for different returns to education.

Table 3: Education and Wages by Education System

	Foreign Education					Swiss Education				
country	Nobs	Years of educ.		Wage		Nobs	Years of educ.		Wage	
		mean	SD	mean	SD		mean	SD	mean	SD
Germany	623	16.26	3.12	56.00	23.59	36	14.82	3.14	46.74	15.55
Finland	19	16.18	3.15	57.23	20.69	2	13.50	4.95	51.53	18.24
France	374	14.83	3.41	51.90	28.51	21	13.74	2.90	40.42	14.64
UK	122	16.39	3.45	70.23	34.32	9	13.56	3.11	52.54	23.39
Italy	1,032	12.43	2.80	40.56	17.13	349	12.56	2.22	39.65	15.32
Netherl.	72	15.66	3.04	59.73	28.17	6	15.17	3.76	44.21	9.97
Austria	92	14.47	3.20	47.42	17.87	10	14.10	3.04	49.37	28.06
Portugal	347	10.11	1.97	30.59	11.61	24	11.17	1.27	29.70	7.49
Spain	186	11.81	3.15	39.44	18.31	70	13.16	2.72	42.30	19.37
Turkey	74	12.80	3.53	36.55	14.80	23	11.33	2.28	31.40	12.31
Switzerl.						11,051	13.09	2.58	44.86	19.10
Foreigners		13.57	3.62	45.95	23.35		12.79	2.53	40.18	16.32

Source: SLFS 2002 and 2003, own calculations.

Figure 1 shows the distribution of education within the nationalities of interest. It turns out that there are huge differences between the foreigners from different countries.

While there are some countries with at least 50 % of persons living in Switzerland who have completed at least 17 years of education, there also exist some countries where more than 50 % have at most completed the minimum schooling. It is remarkable that less than 40 % of all Swiss have completed a higher education than apprenticeship and only about 20 % have completed university. Even though there are huge differences between the nationalities, this should be no problem if the wage equation is linear in education. Nevertheless figure 1 reveals that there are big differences between the different nationalities. This might be an indication for selectivity in a way that people with different education levels have different incentives to migrate to Switzerland.

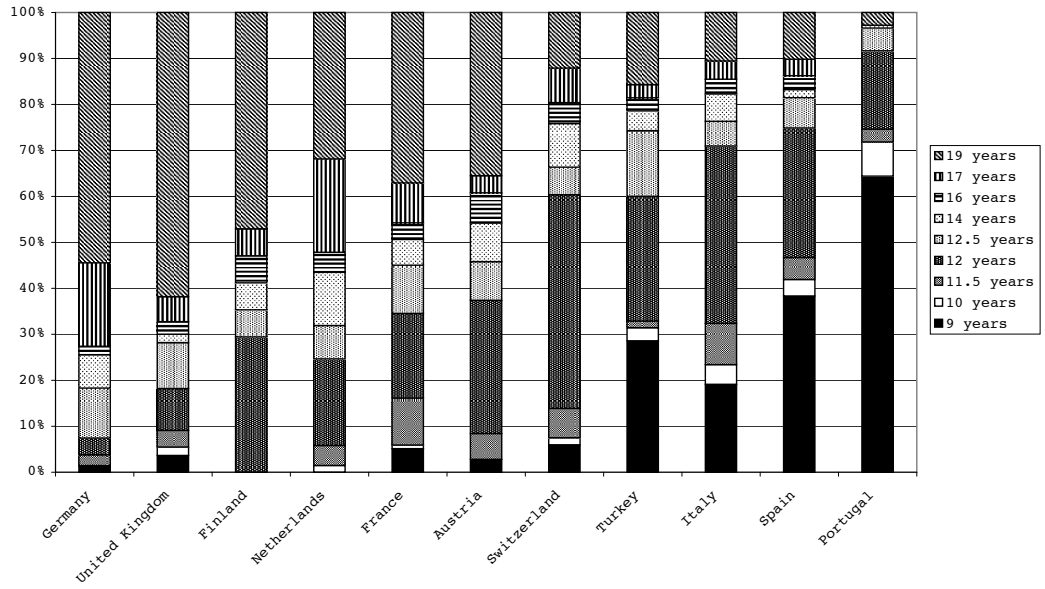

Figure 1: Share of Education (Source: SLFS 2002 and 2003, own calculation)

To reduce this selectivity problem I use a variable which indicates the hierarchic position of a job. Figure 2 shows the share of the hierarchic position in a job by nationalities. More than 50% of persons which have completed their education in the UK, Germany or the Netherlands hold an academic or leading position. On the other hand less than 10 % of the people who finished their education in Portugal work in a higher position. Even though the education determines the position of the job strongly, there are differences in the rank of the countries between the two figures. Including the job position in a regression allows for comparing persons from different countries within the same hierarchic cell and thus reduces the problem of selectivity.

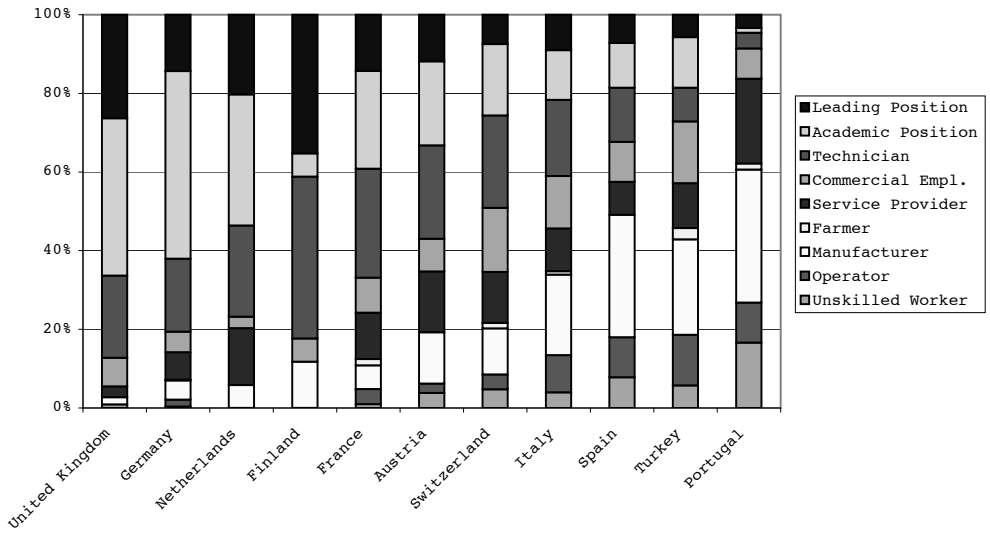

Figure 2: Share of Occupation (Source: SLFS 2002 and 2003, own calculation)

3 Estimation Method

As starting point I use an extended version of the Mincerian wage equation (Mincer (1974)):

$$ln(wage_i) = \alpha + \beta_1 \cdot S_i + \beta_2 \cdot Exp_i + \beta_3 \cdot Exp_i^2 + \Psi \cdot \beta_4 + \epsilon_i \tag{1}$$

$ln(wage_i)$ denotes the natural logarithm of the gross hourly wage rate. The dataset I use provides information on earnings, paid holiday and working hours, thus it is possible to construct the gross hourly wage rate. The variable of interest is the numbers of years of education (S_i) with a range from 9 years (compulsory schooling) to 19 years (PhD). It is measured as the number of years theoretically needed to complete the highest reported education level. Following Mincer (1974) I use the potential experience[8] and its squared as control variable. Because of the richness of this dataset I am able to control for a lot of other factors of influence (Ψ). Thus in a first step I include tenure, its square, and a dummy for female. In a second step I include dummies for the position of a person in its job and choose craftsmen as default. Including these variables is very important to deal with the problem of selectivity. Because of the different shortness of skills, it is easier to immigrate into Switzerland for some levels of qualification while it is more complicated for other levels. Thus including the job position in a regression allows for comparing persons from different nationalities within the same hierarchic cell and therefore reduces the problem of selectivity strongly.[9] In two furthers steps I additionally include dummies

[8]Potential experience is computed as age − years of education − 6.5 as a average school enrollment age.

[9]Because of the positive correlation between the years of education and the job position, including the job position forecloses the interpretation of the slope coefficient β_1 as the return to education in the

for 16 sectors and for the 26 political districts (cantons) of Switzerland.

For the main part of the paper I concentrate on foreigners working in Switzerland. To estimate the country specific return to education I modify equation (1) slightly:

$$\begin{aligned} ln(wage_i) &= \alpha + \beta_1 \cdot S_i + \beta_2 \cdot Exp_i + \beta_3 \cdot Exp_i^2 + \Psi \cdot \beta_4 + \\ &\quad + \delta_{UK} + \delta_{IT} + \cdots + \delta_{PT} + \\ &\quad + \gamma_{UK} \cdot S_i^{UK} + \gamma_{IT} \cdot S_i^{It} + \cdots + \gamma_{PT} \cdot S_i^{Pt} + \\ &\quad + \epsilon_i \end{aligned} \tag{2}$$

Instead of estimating one constant and one single return to education for the whole population I estimate one baseline intercept (α) and one baseline return to education (β_1) for the German system and separate intercepts as well as additional slope coefficients for each country. Thus for example a person who completed education in the UK experiences an intercept of $\alpha_{UK} = \alpha + \delta_{UK}$ and obtains a return to education of $(\beta_{1,UK} = \beta_1 + \gamma_{UK}) \cdot S_i$ for each additional year of schooling. Again I stepwise include additional control variables.

I estimate equation (2) for foreigners with foreign education as well as for foreigners with Swiss education. While the first regression reveals the differences between the returns to the different education systems and might be biased due to nationality specific characteristics, the second reveals this nationality specific characteristics. (I discuss this in the following section in detail)

4 Results

In this section I provide results from the extended Mincer equation. I estimate this regression for all observations. In a second step I concentrate on foreigners to estimate the education system specific return to education described in equation 2.[10]

4.1 Return to Education

Table 4 shows the results for all fulltime working persons. In panel (A) I present the results of the standard Mincer schooling function for more than 17'000 observations. The return to education is in line with findings in the literature [11] (0.077). Additional the

Mincerian way. Nevertheless this coefficient reveals partly the return to *additional* education and thus I will use this expression aware that it is not the same as defined by Mincer (1974).

[10] I will use the OLS-Regression for simplicity. Following Heckmann (1979) selectivity might cause biased estimators especially for women. Nevertheless first results show that there a no significant differences of the estimated return to education wether I use OLS or Heckmann 2 Step estimator.

[11] See Weber and Wolter (1999) for a review of Switzerland-specific return rates and Weber et al. (2001) for more recent estimations.

Table 4: Return to Education

lnwage	Coef.	SE	Coef.	SE	Coef.	SE	Coef.	SE
	A		B		C		D	
Education	0.076**	0.001	0.052**	0.001	0.051**	0.001	0.049**	0.001
Female	-0.141**	0.005	-0.171**	0.005	-0.158**	0.005	-0.160**	0.005
Pot. Exp.	0.032**	0.001	0.029**	0.001	0.029**	0.001	0.029**	0.001
Pot. Exp.^{2}	-0.001**	0.000	-0.000**	0.000	-0.000**	0.000	-0.000**	0.000
Tenure	0.005**	0.001	0.006**	0.001	0.005**	0.001	0.006**	0.001
Tenure^2	0.000	0.000	-0.000*	0.000	-0.000*	0.000	-0.000**	0.000
Leading Pos.			0.351**	0.009	0.339**	0.009	0.335**	0.009
Academ. Pos.			0.260**	0.009	0.235**	0.009	0.229**	0.009
Technician			0.210**	0.007	0.175**	0.008	0.172**	0.008
Comm. Empl.			0.132**	0.008	0.092**	0.008	0.091**	0.008
Serv. Prov.			-0.011	0.009	0.025**	0.009	0.025**	0.009
Farmer			-0.117**	0.021	-0.057*	0.023	-0.060*	0.023
Operator			-0.023*	0.010	-0.029**	0.010	-0.025*	0.010
Unskilled			-0.081**	0.012	-0.077**	0.013	-0.078**	0.012
Years Migra					-0.001**	0.000	-0.001**	0.000
Year D.	yes		yes		yes		yes	
Sector D.	no		no		yes		yes	
Canton D.	no		no		no		yes	
Constant	2.352**	0.015	2.564**	0.015	2.567**	0.016	2.641**	0.017
Observations	17'092		17'092		17'092		17'092	
R^2	0.406		0.488		0.519		0.534	
Adj. R^2	0.405		0.488		0.518		0.532	

Source: SLFS 2002 and 2003, own calculations. $^+$ 10% significance, * 5% significance, ** 1% significance

coefficients for experience and tenure are in line with the theory which predicts a positive but decreasing slope. Interestingly the coefficient for the female dummy is quite high and significantly negative. Estimating two separate regressions for men and women yields the same difference in the constant and no significant (on the 5 % level) difference in the slope coefficient for the return to education.[12] Already this lean regression is able to explain more than 40 % of the total variance of the log wage. Including the job-position dummies (Panel (B)) seems to be very important, the adjusted R^2 increases by more than 20 %. Additionally all job position dummies but the dummy for *Service Providers* are significantly different form the default job position (craftsmen). Because the position of a job is correlated with the level of education, the slope coefficient of years of additional education decreases (0.052) but still remains strongly significant. Thus on the one hand additional education increases the wage through the higher probability of working in a higher position and on the other hand it also increases the wage directly. All other variables remain significant and of the same sice as in panel (A). Interestingly, the inclusion of the job position dummy sharpens the difference between men and women. In

[12]Results are available on request.

panel (C) and (D) I include sector dummies and dummies for the cantons. The adjusted R^2 increases slightly, but the variable of main interest, the return to education, is nearly unaffected. Thus table 4 shows once again the importance of the years of education in determining the individual wages.

In a next step I show the differences in the return to schooling between ten European education systems.

4.2 Return to Foreign Education

The main interest of my study are the differences of the education system specific return to education. For this reason I concentrate on those foreigners who have completed their education before immigrating to Switzerland. This reduces the sample to almost 3'000 observations. Even though I do not know where these persons have completed their education I use the nationality as a proxy for the education system.

Table 5: Foreign Education (Baseline Germany)

lnwage	Coef. A	Coef. B	Coef. C	Coef. D
Education	0.049**	0.037**	0.035**	0.036**
Finland	0.017	0.011	0.008	0.004
France	0.019**	0.013*	0.018**	0.016 **
UK	-0.007	0.001	0.003	0.001
Italy	0.022**	0.013*	0.012*	0.012 *
Netherl.	-0.006	-0.013	-0.020$^+$	-0.025 *
Austria	0.006	-0.002	0.000	-0.003
Portugal	0.006	0.003	0.006	0.002
Spain	0.035**	0.022**	0.021**	0.019*
Turkey	0.017	0.009	0.006	0.002
Country Dummy				
Finland	-0.031	-0.023	0.002	0.036
France	-0.146**	-0.100*	-0.138**	-0.134**
UK	0.252**	0.157*	0.119$^+$	0.124$^+$
Italy	-0.229**	-0.156**	-0.189**	-0.148**
Netherl.	0.096	0.135	0.181*	0.196*
Austria	-0.113	-0.039	0.071	-0.056
Portugal	-0.353**	-0.230**	-0.238**	-0.219**
Spain	-0.262**	-0.165**	-0.190**	-0.180**
Turkey	-0.321**	-0.206**	-0.207**	-0.198**
Job D.	no	yes	yes	yes
Sector D.	no	no	yes	yes
Canton D.	no	no	no	yes
Constant	2.879**	2.899**	2.903**	2.914**
Observations	2'941	2'941	2'941	2'941
R^2	0.445	0.515	0.560	0.580
Adj. R^2	0.440	0.510	0.552	0.569

Notes: Please find the full table in the appendix (table (9). The control variables used in this regression are: *experience*, $experience^2$, *tenure*, $tenure^2$ and a dummy for sex.
Source: SLFS 2002 and 2003, own calculations.$^+$ 10% significance, * 5% significance, ** 1% significance

In panel (A) of table 5 I show the results of the standard Mincer-equation with the

exception that I include a country specific dummy and interact the years of schooling with the nationality. The table reads as follows: a person who finished schooling in Germany can expect a basic log wage of 2.879 for the compulsory schooling and a return to additional education by 4.9 % for each additional year of schooling. If a person finished education in the UK she experiences a basic log wage of 3.131 (2.879+0.252) which is significantly higher at the 1 % level than the German intercept and a return to additional education of 4.2% (0.049−0.007).[13] On the other hand a person who finished schooling in Portugal only experiences an intercept of 2.526 which is significantly lower than the German intercept and a return for each additional year of education of 5.5 % (0.049 + 0.006).[14] There are countries with a very low intercept (the countries from southern Europe), but which partly have a significantly higher return to additional education.[15]

One explanation might be that persons from this countries are in general less qualified if they only obtain the compulsory education (which is a part of the intercept), but that they increase their productivity strongly if they receive additional education. Another reason might be signalling.[16] Persons from this special countries might have a bad signal which is minor if they achieve further schooling. Winkelmann and Winkelmann (1997) have shown that in New Zealand the return to education for Maori is higher than for non-Maori. Thus Maori who usually have only little education, experience a higher penalty on the labor market outcome in comparison to those with higher education. A third reason might be selectivity. To control for selectivity I include the job-position dummies. This reduces the problem of selectivity, because within a job cell the quality of workers should be comparable.

Adding the job-position dummies reduces the return to additional education for nearly all education systems for the reasons mentioned above, but all coefficients remain significant. (Panel (B)) Additionally the adjusted R^2 increases strongly (0.510), thus including the job-position dummies seems very useful again. As seen before the penalty for women is high and increases if I include the job position dummies. In Panel (C) and (D) I include sector dummies and canton dummies which on the one hand rises the explanatory power of our model and on the other hand does hardly effect the estimated coefficients. Again,

[13]Please notice that in the text I discuss the point estimates of the country specific dummies and the slope coefficients even if they are not significant always. One reason might be that there are no differences another reason might be that there are to little observations. Assuming the latter, the point estimates are the best estimators.

[14]One problem might occur because of the languages spoken in Switzerland. It should be easier for German and Austrian to work in a German speaking part of Switzerland and for French in a French speaking part of Switzerland due to the languages. But even if I exclude all those foreigners who work in a canton where their mother-tongue is spoken, the results remain stable.

[15]This contradicts the findings of de Coulon (1998). He shows that the return to education seems to be much lower for the traditional immigrants.

[16]See Spence (1973) for details of the signaling theory.

the control variables seem to be unaffected by including the additional dummies and are in line with the theory. The most enriched regression explains far nearly 60% of the total variation of the wage rate ($R^2 = 0.580$).

These results show first evidence for differences in the value of education obtained in different education systems. There are education systems with significantly different slopes and statistically different intercepts. But the country specific intercept contains both: nation specific characteristics and an education specific return to compulsory education. To distinguish between the system specific return to basic schooling and the nation specific fixed characteristics I estimate the same equation using a sample of foreigners who obtained Swiss education only.

Because all foreigners of different nationalities have obtained the same education, the remaining differences cannot stem from different basic education. One reason might be differences in ethnic capital. Ethnic Capital, first mentioned by Borjas (1992), describes an ethnic spillover effect within an ethnic group. He shows that earnings of a person are not only affected by parental earnings but also strongly by the mean earnings of the ethnic group. Bauer and Riphahn (2004) investigate the educational attainment of the second generation immigrants in Switzerland. They show that the chance of achieving higher education is strongly correlated with the level of education of the parents. Thus estimating equation (2) within a sample of foreigners who have obtained Swiss education only reveals the nationality specific characteristics which should be highly correlated with the unobserved nationality specific characteristics in the foreign education sample.

Under this assumption, contrasting the intercept of both estimations (Foreign education and Swiss education) yields the education specific return to education:

$$\begin{aligned} \alpha_j^f &= \nu_j^f + \eta_j \\ \alpha_j^s &= \nu_j^s + \eta_j \end{aligned}$$

with $\alpha_j^f = \alpha^f + \delta_j^f$ as country specific intercept of country j estimated with foreigners attended foreign education. (f indicates the coefficients estimated with the foreign education sample, while s indicates coefficients estimated with Swiss education sample) α_j^s denotes the country specific intercept of country j estimated with foreigners attended Swiss education. ν_j^i ($i \in [f, s]$) reports the return to basic education, while η_j denotes the nation specific characteristics.

$$\alpha_j^f - \alpha_j^s = \nu_j^f - \nu_j^s + \eta_j - \eta_j = \nu_j^f - \nu_j^s = \nu_j \tag{3}$$

This difference reveals the relative return to basic education of country j in comparison to the Swiss education (ν_j). This approach is comparable to the Oaxaca-Blinder decomposition (Oaxaca (1973)).[17]

Table 6 shows the results for all foreigners who attended only Swiss education.

[17]For the slope coefficient the analysis is slightly different. If the nation specific characteristics and the

Table 6: Swiss Education (Baseline Germany)

lnwage	Coef. A	Coef. B	Coef. C	Coef. D
Education	0.063**	0.034*	0.034*	0.034*
Finland	0.011	0.017	0.015	0.001
France	-0.029	-0.025	-0.020	-0.018
UK	-0.006	0.018	-0.003	-0.007
Italy	0.002	0.010	0.012	0.011
Netherl.	-0.016	0.010	-0.001	0.007
Austria	0.050	0.054^{+}	0.047	0.051
Portugal	0.040	0.034	0.028	0.031
Spain	0.003	0.009	0.010	0.010
Turkey	0.035	0.044	0.035	0.031
Country D.				
Finland	0.140	0.046	0.091	0.235
France	0.125	0.118	0.116	0.107
UK	0.273	0.114	0.204	0.236
Italy	-0.029	-0.068	-0.074	-0.045
Netherl.	0.086	-0.175	-0.047	-0.081
Austria	-0.150	-0.152	-0.108	-0.085
Portugal	-0.093	-0.102	-0.068	-0.068
Spain	0.013	-0.026	-0.024	-0.021
Turkey	-0.142	-0.172	-0.134	-0.114
Job D.	no	yes	yes	yes
Sector D.	no	no	yes	yes
Constant	2.546**	2.801**	2.770**	2.792**
Canton D.	no	no	no	yes
Observations	550	550	550	550
R^2	0.421	0.511	0.535	0.557
Adj. R^2	0.394	0.479	0.491	0.491

Notes: Please find the full table in the appendix (table (10). The control variables used in this regression are: *experience*, $experience^2$, *tenure*, $tenure^2$ and a dummy for sex.
Source: SLFS 2002 and 2003, own calculations.$^{+}$ 10% significance, * 5% significance, ** 1% significance

A first very interesting result is that the education specific coefficients do differ while the coefficients of the control variables differ only a little.[18] In contrast there are differences in the return to compulsory education and the return to additional education between both tables. While table 5 shows significantly different coefficients, there are no statistical differences in table 6.

Comparing the level of the coefficients in panel (A) of both tables shows an interesting result. While the return to education is below 5 % for foreigners with foreign education, it

years of schooling are correlated the return to additional schooling ($\beta_j = \beta_1 + \gamma_j$) is biased. (Card (1994), Blackburn and Neumark (1993)) It is a well known result that $\hat{\beta}_j = \beta_j + \frac{cov(S_i,\eta_j)}{Var(S_i)}$ is only unbiased if the years of schooling are uncorrelated with the nationality specific characteristics. Assuming that η_j is the same for foreigners with Swiss education as well as foreigners with foreign education, it depends on the variance and the covariance if the difference of the slope coefficients eliminates the bias. This is only the case if the fraction is stable within one nationality. Unfortunately this cannot be solved empirically. Thus for the latter I assume that taking differences will remove the bias.

[18] See table 9 and table 10 in the Appendix.

is above 6% for foreigners with Swiss education. This might be evidence for the hypothesis that human capital is not perfectly transferable between countries. The result is in line with the findings of de Coulon (2001). He shows that in general the return to schooling obtained in Switzerland is higher than the return obtained in the home country. He also shows that the return to schooling in Switzerland is much lower for immigrants from the traditional immigration countries. Adding the job position dummies in panel (B) to (D) captures the advantages of the Swiss education.

Using the results of table 6 we can distinguish between the differences in the education systems and the differences because of nation specific characteristics. For this purpose I use equation (3) to calculate the return to basic education and the return to additional education unaffected by the nation specific characteristics. This comparison (table 7[19] sharpens the picture seen before. It shows that there are huge differences in the return to compulsory education net of nationality specific characteristics ($SD = 0.167$). This might be evidence for the different economic value of the basic education of different education systems in the Swiss labor market. Additionally the analysis shows that there are some countries with relatively high returns to compulsory schooling but mostly lower returns to additional schooling. The traditional immigration countries have a lower return to compulsory schooling and a higher return to additional schooling.

Table 7: Foreign & Swiss Education: Basic & Return

	Basic Education			Return			
	Foreign	Swiss	Diff.	Foreign	Swiss	Diff.	PISA
Germany	2.903	2.801	0.102	0.035	0.034	0.001	492.67
Finland	2.905	2.847	0.058	0.042	0.051	-0.009	542.50
France	2.766	2.919	-0.153	0.052	0.009	0.043	506.67
UK	3.023	2.915	0.108	0.037	0.052	-0.015	528.00
Italy	2.714	2.733	-0.019	0.047	0.044	0.003	475.33
Netherl.	3.084	2.626	0.458	0.015	0.044	-0.029	525.00
Austria	2.833	2.649	0.184	0.034	0.088	-0.054	504.83
Portugal	2.665	2.699	-0.034	0.041	0.068	-0.027	465.50
Spain	2.714	2.775	-0.061	0.056	0.043	0.013	485.50
Turkey	2.696	2.629	0.067	0.040	0.078	-0.038	432.67

Source: SLFS 2002 and 2003, PISA 2000 and PISA 2003 own calculations.

Note: The PISA scores are calculated as the average score of PISA 2000 and PISA 2003 averaged over the three disciplines. The analysis for the return relies on the strong assumption that the bias within the Swiss education estimation and the foreign education estimation is the same.

[19] Even though not all coefficients are significant I use the point estimates for this comparison.

4.3 Comparison with PISA and usual return rates

A very different approach to analyze the quality of education is the PISA (Programme for International Student Assessment) approach. The goal of PISA is to compare the education systems in more than 40 countries. The study started in 2000, has been repeated in 2003 and will be repeated again in 2006. In all participating countries 15-year old pupils have to solve standardized tests in reading, mathematics and sciences. The result is a huge number of test scores which can be collapsed into three different scores for the three disciplines (OECD (2002) and OECD (2004)).

In this section I compare the economic value of education of different education systems with the school achievement measured by PISA. In a very recent study Blau and Kahn (2005) have shown using the International Adult Literacy Scores, which allows for controlling the cognitive skills of adults across countries, that an increase in the test scores raises wages significantly.

The last column of table 7 shows the average PISA scores of the countries of interest. Because PISA 2000 and 2003 provides three different scores for reading, mathematics and sciences, I construct an aggregated score with equal weights for all categories.[20] To compare the PISA scores with the returns to different education systems I use the returns to compulsory schooling (diminished by the nationality specific characteristics). The reason is that in most of the countries the compulsory schooling lasts until the 15th or 16th birthday. Because PISA asks 15 year old pupil to answer the questions, this comparison seems to be appropriate.

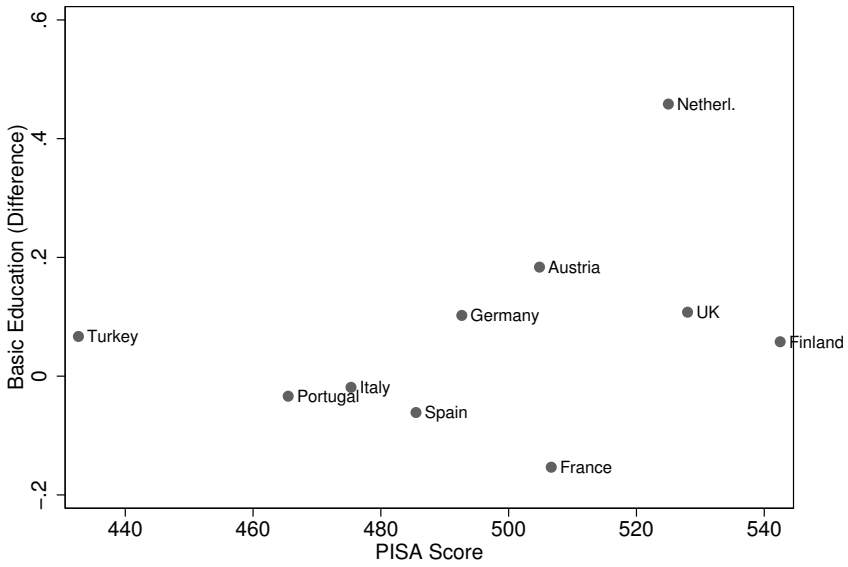

Figure 3: Basic Education vs. PISA Score (ρ=0.344)

[20] A factor analysis has shown that the correlation between the three subject is between 0.95 and 0.99.

Figure 3 shows the plot of the return to basic education against the average PISA scores. There exists a positive correlation between both scores ($\rho = 0.344$). Excluding Turkey (all Turks in the dataset I use have completed only 5 years of compulsory schooling) increases the correlation above 0.450.[21] This result can be deemed to be an indicator that the content of the schooling test is a good measure for the economic value of education.[22]

A comparison of the returns to additional education with the returns to education provided in table (1) allows for evaluation of the results. The estimates in table (1) might be biased due to ability and selectivity and a cross country comparison might be biased due to country specific labor markets. In contrast my results are estimated within the same labor market and after inclusion of the job position dummy partly controlled for selectivity. Table (8) provides this correlations.

Table 8: Comparison: Return to Education

	Men	Women
col (1) of table (1)	-0.277	0.005
col (3) of table (1)	0.136	0.232

Source: Harmon and Westergaard-Nielsen (2001), SLFS 2002 and 2003, own calculations.
Note: Please notice that Turkey was not part of the PURE project and thus it is not included in this comparison. Because I do not estimate separate regressions for men and women, I show both correlations.

At first glance the correlations are at a low degree but slightly higher for women. Using the estimates of column (1) of table (5) the correlations is even negative for man, but after inclusion of dummies for the job position and the sectors, it turns positive. The main conclusion of this analysis is that there are huge differences between both estimation methods. This might be evidence for the hypothesis that a comparison across countries with different labor market institutions does not reflect the true differences of the returns to education.

5 Conclusion

In the economic literature there exists a lot of studies which have tried to calculate the return to education and to compare the returns between countries. This study is the first which compares the value of different education systems within one labor market and

[21] Using the differences of the returns to additional education for the comparison with PISA, the results is slightly weaker ($\rho = 0.154$). But notice that (1) PISA analysis the quality of the basic education and not of further education and (2) that the returns estimated in this study are likely to be biased.

[22] This implication is only true if the value of an education system is stable over time, because I compare at least two different cohorts. While the PISA pupils are born after 1985, the workers I use in the analysis are born between 1938 and 1987.

thus reduces biases due to different institutions and other country specific characteristics. I use the Mincerian wage equation to estimate returns to education in Switzerland and especially returns to foreign education in Switzerland. Using employees in Switzerland who have completed education in their home country results show that there are indeed very different returns for different education systems. I also show that there are huge and significant differences for the return to compulsory education. I use estimates of foreigners who attend Swiss schooling to calculate the effect of country specific characteristics to reveal the true effect of compulsory education. This analysis shows that there are some countries with relatively high returns to compulsory schooling but mostly lower returns to additional schooling.

A correlation with the PISA scores shows that the schooling test seems to measure the economic value of education slightly good. The comparison of the returns to education shows that different labor markets might bias the cross country relation.

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A Appendix

A.1 Additional Tables

Table 9: Foreign Education (Baseline Germany)

lnwage	Coef.	SE	Coef.	SE	Coef.	SE	Coef.	SE
	A		B		C		D	
Education	0.049**	0.004	0.037**	0.004	0.035**	0.004	0.036**	0.004
Finland	0.017	0.024	0.011	0.023	0.008	0.022	0.004	0.022
France	0.019**	0.006	0.013*	0.006	0.018**	0.006	0.016**	0.006
UK	-0.007	0.009	0.001	0.009	0.003	0.008	0.001	0.008
Italy	0.022**	0.005	0.013*	0.005	0.012*	0.005	0.012*	0.005
Netherl.	-0.006	0.013	-0.013	0.012	-0.020^{+}	0.012	-0.025*	0.012
Austria	0.006	0.011	-0.002	0.011	0.000	0.010	-0.003	0.010
Portugal	0.006	0.010	0.003	0.009	0.006	0.009	0.002	0.009
Spain	0.035**	0.009	0.022**	0.008	0.021**	0.008	0.019*	0.008
Turkey	0.017	0.011	0.009	0.011	0.006	0.010	0.002	0.010
Country D.								
Finland	-0.031	0.190	-0.023	0.178	0.002	0.170	0.036	0.170
France	-0.146**	0.046	-0.100*	0.043	-0.138**	0.042	-0.134**	0.043
UK	0.252**	0.076	0.157*	0.072	0.119^{+}	0.069	0.124^{+}	0.068
Italy	-0.229**	0.036	-0.156**	0.035	-0.189**	0.033	-0.148**	0.033
Netherl.	0.096	0.097	0.135	0.091	0.181*	0.087	0.196*	0.086
Austria	-0.113	0.074	-0.039	0.069	-0.071	0.066	-0.056	0.066
Portugal	-0.353**	0.038	-0.230**	0.037	-0.238**	0.036	-0.219**	0.037
Spain	-0.262**	0.046	-0.165**	0.043	-0.190**	0.042	-0.180**	0.042
Turkey	-0.321**	0.064	-0.206**	0.060	-0.207**	0.058	-0.198**	0.057
Female	-0.161**	0.013	-0.180**	0.013	-0.168**	0.013	-0.170**	0.013
Pot. Exp.	0.028**	0.003	0.026**	0.002	0.028**	0.002	0.029**	0.002
Pot. Exp.^{2}	-0.001**	0.000	-0.000**	0.000	-0.000**	0.000	-0.001**	0.000
Tenure	0.008**	0.002	0.007**	0.002	0.007**	0.002	0.006**	0.002
Tenure^2	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Leading Pos.			0.374**	0.024	0.371**	0.025	0.372**	0.024
Academ. Pos.			0.216**	0.023	0.209**	0.023	0.219**	0.023
Technician			0.225**	0.021	0.202**	0.022	0.214**	0.022
Comm. Empl.			0.110**	0.024	0.096**	0.025	0.102**	0.024
Serv. Prov.			-0.044*	0.022	0.032	0.024	0.047^{+}	0.024
Farmer			-0.214**	0.063	-0.025	0.073	-0.014	0.072
Operator			-0.016	0.026	-0.013	0.025	0.006	0.025
Unskilled			-0.090**	0.031	-0.057^{+}	0.031	-0.038	0.031
Years Migra					-0.001	0.001	-0.001	0.001
Year D.	yes		yes		yes		yes	
Sector D.	no		no		yes		yes	
Canton D.	no		no		no		yes	
Constant	2.879**	0.080	2.899**	0.077	2.903**	0.076	2.914**	0.075
Observations	2'941		2'941		2'941		2'941	
R^2	0.445		0.515		0.560		0.580	
Adj. R^2	0.440		0.510		0.552		0.569	

Source: SLFS 2002 and 2003, own calculations.$^{+}$ 10% significance, * 5% significance, ** 1% significance

Table 10: Swiss Education (Baseline Germany)

lnwage	Coef.	SE	Coef.	SE	Coef.	SE	Coef.	SE
	A		B		C		D	
Education	0.063**	0.015	0.034*	0.014	0.034*	0.015	0.034*	0.015
Finland	0.011	0.058	0.017	0.054	0.015	0.054	0.001	0.057
France	-0.029	0.026	-0.025	0.025	-0.020	0.025	-0.018	0.025
UK	-0.006	0.035	0.018	0.033	-0.003	0.033	-0.007	0.033
Italy	0.002	0.017	0.010	0.016	0.012	0.016	0.011	0.016
Netherl.	-0.016	0.036	0.010	0.034	-0.001	0.036	0.007	0.037
Austria	0.050	0.034	0.054^{+}	0.032	0.047	0.032	0.051	0.032
Portugal	0.040	0.049	0.034	0.045	0.028	0.045	0.031	0.046
Spain	0.003	0.019	0.009	0.018	0.010	0.018	0.010	0.018
Turkey	0.035	0.030	0.044	0.028	0.035	0.028	0.031	0.029
Country D.								
Finland	0.140	0.335	0.046	0.312	0.091	0.309	0.235	0.316
France	0.125	0.155	0.118	0.145	0.116	0.144	0.107	0.149
UK	0.273	0.199	0.114	0.186	0.204	0.187	0.236	0.189
Italy	-0.029	0.103	-0.068	0.096	-0.074	0.096	-0.045	0.099
Netherl.	0.086	0.255	-0.175	0.238	-0.047	0.255	-0.081	0.264
Austria	-0.150	0.207	-0.152	0.192	-0.108	0.194	-0.085	0.196
Portugal	-0.093	0.154	-0.102	0.144	-0.068	0.143	-0.068	0.151
Spain	0.013	0.116	-0.026	0.109	-0.024	0.109	-0.021	0.113
Turkey	-0.142	0.131	-0.172	0.123	-0.134	0.122	-0.114	0.129
Female	-0.143**	0.027	-0.164**	0.027	-0.165**	0.028	-0.166**	0.029
Pot. Exp.	0.033**	0.006	0.035**	0.005	0.036**	0.005	0.037**	0.005
Pot. Exp.^{2}	-0.001**	0.000	-0.001**	0.000	-0.001**	0.000	-0.001**	0.000
Tenure	0.005	0.006	0.006	0.006	0.004	0.006	0.004	0.006
Tenure^2	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Leading Pos.			0.333**	0.050	0.329**	0.052	0.330**	0.054
Academ. Pos.			0.271**	0.042	0.254**	0.045	0.260**	0.046
Technician			0.229**	0.036	0.190**	0.039	0.187**	0.040
Comm. Empl.			0.133**	0.038	0.105*	0.041	0.105*	0.041
Serv. Prov.			-0.004	0.042	0.017	0.046	0.023	0.047
Farmer			-0.171	0.151	-0.132	0.162	-0.06	0.168
Operator			0.06	0.055	0.06	0.057	0.057	0.062
Unskilled			-0.085	0.104	-0.101	0.104	-0.089	0.106
Year D.	yes		yes		yes		yes	
Sector D.	no		no		yes		yes	
Canton D.	no		no		no		yes	
Constant	2.546**	0.236	2.801**	0.223	2.770**	0.225	2.792**	0.233
Observations	550		550		550		550	
R^2	0.421		0.511		0.535		0.557	
Adj. R^2	0.394		0.479		0.491		0.491	

Source: SLFS 2002 and 2003, own calculations.$^{+}$ 10% significance, * 5% significance, ** 1% significance

A.2 The Country Specific Education Systems

In this section I very briefly describe the different education systems of the countries of interest.[23] Because of the very different education systems I concentrate on the main routes. In a second part I provide different returns to education estimated in former studies.

[23]The information is mainly based on the description provided by http://www.dija.de/ (08.12.2004) and http://bildungssysteme-international.dipf.de/ (08.12.2004).

Austria

In Austria the compulsory school takes 9 years from age 6 to age 15. It starts with a four year primary education which is the same for all pupils. After this they can chose between three types of schooling. Either they join a lower secondary school (4 years) and an additional year in a polytechnic course which qualifies for lower apprenticeship or join a 6 year secondary school which allows for higher apprenticeships. The different types of apprenticeship last between two and four years. The third choice is the academic secondary school which lasts for additional 8 years and qualifies for university. This is usually followed by an tertiary education provided by an university which lasts for four to five years. Additional university alumni have the chance to join doctoral courses which lasts for at least 2 years. Beside the university there are other non academic education like polytechnic college with a duration of three or four years.

Finland

In Finland the compulsory school takes 9 years from age 7 to age 16 which provides the basic education. This is either followed by three years of vocational training or three years of secondary education. After vocational training the students have the possibility to join an additional three to four year lasting polytechnic education. Students who finished the secondary school have the permission to enter university and finish after three years with a lower degree (BA) or after five years with a higher degree (MA). Additional it is possible to add a doctoral study which last for at least three years.

France

In France the compulsory school takes from age 6 to age 16. It contains five years of primary education and is followed by a four years lasting secondary education. Beside this main track it is possible to join a polytechnic school for the eighth and ninth year. The nine years of schooling are followed by either a vocational education (apprenticeship with work experience and additional schooling) or a higher secondary education for those who have finished the secondary school. The last track is very popular in France; about 75 % chose this education. After this higher secondary school education is continued at university. After two additional years the only selection process selects the best students to finish the *Grande Ecole* after all in all five years of university education. Other student can leave university after three or four years.

Germany

In Germany the compulsory school takes 9 years from age 6 to age 15. For those who leave school with 15 three additional years of apprenticeship (including vocational schooling)

are mandatory. After four years of primary education the pupils are divided into three groups. One group joins the lower secondary education which last for five to six years and meets in lower apprenticeship. Another group receives secondary education on a six year high school which allows for higher apprenticeships. The bests pupils join the nine year high school which allows studies at a university. Studies at a university lasts four to five years and can be completed with a doctoral study which lasts for at least three additional years. Beside university there exist technical colleges which all pupils who have finished the twelfth year of schooling can enter. Studies at technical colleges last three or four years.

Italy

In Italy the compulsory school takes 8 years from age 6 to age 14 and is divided in a primary part (5 years) and a lower secondary part (3 years). After completing compulsory education and passing the lower secondary leaving examination, young people may enter one of the five types of upper secondary education courses lasting five (university qualification), four or three years (vocational education). There is no further vocational education in Italy. After completing the five year higher secondary education students have the possibility to enter university and finish between two and three years (lower level) and four to six years (regular level).

Netherlands

In the Netherlands the compulsory school takes 12 years from age 4 to age 16. There is a part-time compulsory school until the age 18. The primary education lasts 8 years and is cut into two parts per four years. After these eight years the students can chose between four different schools (since August 1999 the two lower levels are aggregated) which lead into a vocational training (with age 16) a higher vocational training with age 17 or studies at university (with age 18). The vocational training either contains 70% of schooling and 30% of work or 30% of schooling and 70% work and lasts for two to three years. The studies at university lasts between four and five years and can be completed with a doctoral study.

Portugal

In Portugal the compulsory school takes 9 years from age 6 to age 15. It is divided in six years of primary education and three years of lower secondary education. Upper secondary education provides five different types which last for three years and qualify for university or technical college, last for three years and contains vocational education, or last for four years (apprenticeship). At university students have the choice between a three years

study (lower grade) or a four to six year study (regular grade). After the latter there is the possibility to acquire a higher degree with two additional years or a PhD with four additional years.

Spain

In Spain the compulsory school takes 10 years from age 6 to age 16. The primary education lasts six years and is followed by a four year secondary education. These 10 years are integrated. After this 10 years of compulsory education the students can choose between vocational training or high school which qualifies for university. Both types last for additional two years. The tertiary education is dived in a advanced vocational training a non-university study or an university study. All three types last for three years while there is the possibility of two to three additional years at university which can be followed by another two years of doctoral study.

Turkey

Since 1997 the compulsory school in Turkey takes 8 years (5 years before) from age 7 to age 15. This is divided in a five years lasting primary education and a three years lasting secondary education. Most of the Turkish pupils leave the education after the compulsory school because there is no vocational training. Those who want to get higher education can add additional three years which are required to enter university or technical college. This step lasts two years at the technical college and six years at university which can be completed with a doctoral study. All Turkish immigrants used for this analysis have completed compulsory schooling before 1997 and thus attended at least 5 years of education.

UK

In the UK the compulsory school takes 11 years from age 5 to age 16.[24] There are two secondary education levels from age 11 to age 16 and another one from age 17 to age 18. For those who leave schools with age 16 there is the possibility of a two years lasting vocational training. Those who joined the second step of secondary education have the permission to enter university and can either acquire a bachelor. The third step of the education system is either a vocational education or a university education. The vocational training lasts for two years, the university education can be finished with a bachelor degree after three years. With another two years Students can leave university with a masters degree, which permits for a doctoral study and lasts between three and four years.

[24] There are some deviating rules for Northern Ireland or Scotland which I skip in this brief section.